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This tasteful little volume contains an account of the life-history, habits, and distribution of sixty-two species of the commoner butterflies, which are found in the Eastern States and the Canadian provinces of Quebec and Ontario. It is illustrated by nine plates, eight of which are done in colors, the other being a carefully executed and faithful representation in black and white of an enlargement of the interesting chrysalis of *Feniseca tarquinius*, the curious aphidivorous habits of the larva of which are fully explained by the author. The illustrations in the text are numerous and excellent, and, with the plates, will enable the reader to easily identify the species when encountered in nature.

The study of butterflies is every year gathering new devotees, especially from the rapidly-growing leisure class, and the ranks of the young in our schools and colleges. No field of observation is more accessible and interesting, and none more likely to yield valuable results, from the standpoint of the biologist, than that of entomology. Books, like the one before us, which combine scientific accuracy with a grateful flavor of the woods and the fields, can not fail to stimulate those who are their happy possessors to make researches, which will give charm and delight to life, and may prove of positive scientific interest.

Everything which falls from the pen of Dr. Scudder possesses the merit of literary grace, and, with but very few exceptions, absolute scientific accuracy. If any adverse criticism in general could be passed upon the writings of our learned friend, it is that in his zeal for precision of description and thoroughness of treatment he at times becomes a little prolix. This, however, is a trait wholly absent from the pages of the present book, which are sprightly and popular in style, while profoundly instructive.

Issue must be taken with two statements made by the author on page 281. In speaking of the chrysalis of *Feniseca tarquinius* he says: "Curiously enough, a similar ape's face is seen in the chrysalis of an African butterfly of another genus not very closely related to *Feniseca*, and in an Indian species of the same Oriental genus. Now, in these two cases there is a

strong probability that their larval food is plant lice." The reference is to the chrysalis of *Spalgis s-signata*, Holland = *S. lemolea*, H. H. Druce, which I had the pleasure of describing and figuring in *Psyche* Vol. VI., p. 201, Plate IV., and to the chrysalis of *Spalgis epius*, Westwood, described and figured by Aitken in the eighth volume of the *Journal* of the Bombay Natural History Society, Plate A. A careful examination of the structural peculiarities and of the preliminary stages of the genus *Spalgis* shows that it is very closely related to our North American genus *Feniseca*, and any general classification of the lepidoptera belonging to the family Lycænidae which did not place these genera in propinquity would be in error. The statement of the author that in the case of the two species of *Spalgis* mentioned "there is a strong probability that their larval food is plant lice," overlooks the fact that in both cases the aphidivorous habits of the larvæ have been positively ascertained.

Points like these relating to the habits of exotic species, which are only alluded to in passing, do not in the slightest degree affect the value of the book for the circle of readers for which it is particularly intended, and it may be recommended as altogether one of the most pleasing and instructive contributions made in recent months to a branch of science which is daily growing in importance and popularity.

W. J. HOLLAND.

CARNEGIE MUSEUM, PITTSBURG.

Practical Exercises in Elementary Meteorology.
Ginn & Co., Boston. 1899. Pp. xiii + 199.

One does not expect a laboratory manual to be interesting, yet Mr. Ward's volume will prove attractive reading to any one interested in the teaching of meteorology. It contains materials for laboratory work for all school ages and includes the exercises that within a few years constituted the laboratory work in Mr. Ward's course at Harvard.

The author does himself injustice when he states the object of his book is "to lead the pupil to the independent discovery of the most important facts in our ordinary weather conditions." The very judicious comments that

accompany the exercises tend rather to the rational end of illustrating the laws of meteorology and the method of meteorological study. The well-considered suggestions to teachers propose that in primary schools the attention of pupils be called on occasion to the more obvious relations of the various weather elements to one another and to us. This as a preparation for the exercises of this volume.

Parts I. and II. suggest observations, instrumental and uninstrumental, to be made by one and another member of the class from day to day and kept in a permanent record throughout grammar and high school years. Mr. Ward has prepared numerous questions designed to bring out the simpler relations of the various elements.

Part III.—Exercises in the construction of weather maps—is presumably to be used in high school years. A table of meteorological data for six consecutive days at all weather bureau stations throughout the country is printed at the end of chapter III. (not chapter VIII., as stands printed always in the text). From this pupils are to construct on blank weather maps the isotherms and isobars for each day and the corresponding temperature and pressure gradients. Other blank maps are to be filled out with wind arrows for each day, and still others with the signs for clear and cloudy sky, etc. Besides these construction exercises others are based on the comparative study of the maps thus drawn.

Part IV. contains Correlations of the Weather Elements and Weather Forecasting. These exercises follow naturally on the preceding, going to published weather maps for their data and tending to illustrate the cyclonic and anticyclonic groups of phenomena and their relationships.

These are very valuable exercises from the nature of the results sought and from the fact that they have that definite character which the young student demands. Generalities are his abhorrence, and while all his studies are in the direction of training to generalize from sufficient data he must be allowed a firm footing on particulars at the outset. The demand that he *formulate a general rule* (p. 117) is one that would leave many a high school pupil bewil-

dered. Perhaps he could do it if told in other words.

Some of the problems in Part V. will be beyond the range of many pupils for this reason of their general character. Moreover, as they seek valid results on questions of importance, such as the relation of relative humidity to the direction of the wind, some use should be made of more extended collections of data, made more carefully than is practicable for school classes. It is a pity to base inductions on any but the best of data. I presume all who are teaching young people to make observations are agreed that the immediate object is to train their faculties and show them the scientific method rather than to acquire results. Indeed, it seems to me important that pupils should be led to recognize clearly the rude character of their work as compared with good standards. For this reason it is especially desirable to avoid drudging at observational and mechanical work. Only so much observation is desirable as will help the pupil to understand the process. When it comes to induction he should use the best results specialists have been able to produce. For similar reasons in some of the weather map exercises in Part III. use might be made of the government maps rather than of those produced by the pupil himself, as some of these will be too bad to use and most of them less easily read than the printed maps. I find classes of 13 and 14 years require three fifty-minute periods for the first satisfactory production of one day's isotherms. To reproduce six such days and then six more for isobars and yet more for other elements is to impose task-work. Most teachers will be content with fewer such tasks and as soon as the principle is grasped pass on to use the printed maps.

Mr. Ward has not claimed, however, to give us exercises in shape for immediate use, but rather to offer material from which we could select according to our needs. The materials he offers are abundant and available.

The descriptions of instruments are very clear and simple, and the historic notes and the comments on phenomena and relations between man and the weather very interesting.

Among the instruments one is rather sur-

prised to see the nephoscope, nor is maker or price indicated in the list of instruments. It is a pity to put a doubly-folded sheet like that in Chapter III. in a school-book. It will certainly be torn in the first year. By printing on both sides one fold might have been avoided and there is no good reason why all the data might not have been printed in the text as wanted day by day.

The fact that so many problems are worked out in the book makes it easier reading but will require the books to be closely watched in the class-room.

The Weather Bureau Meteorological Tables are inserted at the end of the book with an excellent appendix on the 'Equipment of a Meteorological Laboratory.'

The book should prove valuable to every teacher of meteorology.

M. S. W. JEFFERSON.

ELMWOOD, MASS., December 19, 1899.

Bacteria, especially as they are related to the Economy of Nature, to Industrial Processes and to the Public Health. By GEORGE NEWMAN, M.D., Demonstrator of Bacteriology, King's College, London. The Science Series. New York, G. P. Putnam's Sons; London, John Murray. 1899. Pp. 348.

The fact that bacteria are concerned in a variety of natural processes and do not devote themselves exclusively to the causation of disease is beginning to touch the popular imagination and to create a demand for treatises that shall deal with the subject of bacteriology from a general biological standpoint rather than a strictly medical one. An attempt to meet this need has been made in the present instance. Dr. Newman discusses, under separate chapter-heads: The Biology of Bacteria, Bacteria in Water, Bacteria in the Air, Bacteria and Fermentation, Bacteria in the Soil, and Bacteria in Milk, Milk Products and other Foods. These six chapters cover 239 pages out of 348. A chapter is then given to The Question of Immunity and Antitoxins, which is followed, by what seems a singular inversion, with one on Bacteria and Disease, and the book ends with a chapter on Disinfection. Many topics of great interest are considered in these pages, and the

author's selection of material and mode of treatment will command general approval. The book is marred, however, by a lax and involved style and contains so many errors of statement as to call seriously for revision. On page 30, for example, it is stated that "boiling for thirty to sixty minutes will kill all bacilli and all spores," and on page 79, "moist heat at the boiling point maintained for five minutes will kill all bacteria and their spores." These statements are not in accord and neither is correct. On page 16 it is erroneously stated that "*Micrococcus agilis* is the only coccus which has flagella and active motion." In the description of Van Ermengem's method of staining flagella (p. 63) it is probably through a typographical slip that a 25.5 per cent. solution of silver nitrate is recommended, and surely the use of boric acid in place of osmic acid in the fixing bath is an unusual procedure. It is hardly a careful form of statement to refer to the power of the tetanus bacillus to produce disease as its 'regular function' (p. 32). The author's definition of the antitoxin unit (p. 263) is incorrect. It is not necessary to multiply instances, but it is to be hoped that subsequent editions may find some of these blemishes removed, since they unquestionably impair the value of an otherwise interesting and useful book.

Two examples of the author's somewhat enigmatic style may be given: "Yet, whilst this general fact is true, we must emphasize at the outset the possibility and practicability of securing absolutely pure sterile milk. Recently some milking was carried out under strict antiseptic precautions, with the above sterile result" (p. 181). "*Budding* occurs in some kinds of yeast, and would be classified by some authorities under spore formation, but in practice it is so obviously a 'budding' that it may be so classified" (p. 16).

E. O. J.

A Treatise on Crystallography. By W. J. LEWIS, M.A., Professor of Mineralogy in the University of Cambridge. Cambridge Natural Science Manuals, Geological Series. Cambridge: At the University Press. 1899. 4to. Pp. xii + 612.

This new text-book of crystallography presents the modern views as to the classification of